Sunny Days, Health Ways CD-ROM Curriculum

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Abbreviated Abstract

Skin cancer is epidemic and prevention must start in childhood to reduce lifetime ultraviolet radiation exposure and severe sunburns. Klein Buendel, Inc. produced an interactive multimedia (CD-ROM) version of the Sunny Days, Healthy Ways (SDHW) elementary school sun safety curriculum and evaluate its effectiveness at increasing knowledge, changing attitudes favorably, and increasing sun safe behavior. The target population for this Phase II project was students enrolled in grades K through 5 in eight public elementary schools in Denver and Greeley, Colorado. Multimedia are increasingly attractive to health educators, teachers, students, and parents. This Phase II project built upon the grade K and 2 prototypes from Phase I to design and produce a complete SDHW multimedia program. Agent-based, knowledge-construction interfaces will be programmed into the CD-ROMs to function as intelligent tutors for students. The ability of the CD-ROM SDHW to improve children's sun protection behavior (primary outcome) was tested in a pair-matched randomized pretest-posttest control group design study, employing 11 schools, 63 classes, and 847 students.

Primary Investigator

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Mary Buller, MA, is President of Klein Buendel, Inc. She has nearly 20 years of experience in cancer prevention research from clinical trials to the latest multimedia technology. Since 1998, she has been the P.I. on multiple SBIR Phase I and Phase II awards to develop prototype CD-ROM programs to educate elementary and middle school children about sun safety and skin cancer prevention, 5 A Day nutrition and to develop computer-based programs to disseminate the 5 A Day nutrition education program to worksite wellness professionals and employees via the Internet, among others. Ms Buller is author or co-author of 20 published peer-reviewed articles and has been a speaker at dozens of professional conferences.

Research Team & Affiliations

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Total Budget

$978,710

Research Objectives

Aim 1: Produce three comprehensive sun safety CD-ROM programs -- one for students in grades Kindergarten and 1, one for students in grades 2 and 3, and one for students in grades 4 and 5 -- based on the Grade K-5 Sunny Days, Healthy Ways (SDHW) skin cancer prevention curriculum. The CD-ROM programs will integrate with the published *SDHW* curriculum, be compatible with current health and science curricula, and be implemented by classroom teachers.
Aim 2: Evaluate the ability of each CD-ROM to increase children's sun protection skills, their attitudes and perceived norm for sun safety, and their use of sun protection (i.e., limiting time in sun, avoiding daily periods of peak ultraviolet radiation, wearing protective clothing and hats, and using sunscreen on exposed skin).
Aim 3: Evaluate satisfaction and acceptance of the CD-ROM programs by elementary school teachers and students.
Aim 4: Develop an Instructor's Guide on integrating the SDHW CD-ROM programs in school health and/or science education.

Theory/Hypothesis

CD-ROM programs can be an effective method of sun safety instruction for elementary school children.

Experimental Design

Group-randomized design (i.e., grades were the unit of randomization not students). The study design called for 72 classes from 12 schools to participate; 12 classes of each grades K through 5. Each of the 12 schools contributed six participating classes that were randomized to condition in a pattern of grades K, 2, and 4 or grades 1, 3, and 5. The number of schools and classes numbers was modified during recruitment. Teachers implemented the CD-ROMs, written SDHW curriculum or both over a 4-week period (29 days on average) in the spring semester, between March 27 and May 31, 2003 (except for one year-round school which implemented the curriculum between May 24 and June 13, 2003.

Final Sample Size & Study Demographics

The final sample size of teachers was 63 (from 11 schools). Of the 63 participating teachers, 92% (n=58) were female and 8% (n=5) were male. They ranged in age from 23 to 60 years old (1.7% missing). With regard to race, 57 teachers (90.5%) were white, 3 were African American (4.8%), and 1 was Asian (1.6%) (3.2% missing). With regard to ethnicity, 56 (88.9%) were non-Hispanic and 4 (6.3%) were Hispanic (4.8% missing).

A total of 847 fully consented students completed both a pretest and a posttest. In summary, 48.4% were female and 50.3% were male (1.3% missing). They ranged in age from 5 years to 13 years (1.7% missing). Students were near evenly split between grade levels (32.1% K-1; 31.2% 2-3, 36.7% 4-5). With regard to race and ethnicity, students were 85% white (33.1% Hispanic), 9.2% African American, and 3.5% Asian (1.9% missing). When classified for skin type, 20.9% were skin type 1 (fair), 30.5% skin type 2, 36.1% skin type 3, and 10.2% skin type 4 (dark) (2.4% missing).

Data Collection Methods

Pretests and posttests were developed for each grade level based on intervention material to assess changes in knowledge and behavior. The posttest also assessed students' satisfaction and usability with the CD-ROM, written curriculum or both. The study staff pre- and posttested students in their classrooms. Study staff would read each question aloud and ask students to circle or mark their answer on the survey. Reading questions aloud helped overcome reading limitations and language barriers (questions were read in Spanish as needed) and kept the class moving at the same pace. Young students (grades K and 1) were tested in small groups to foster assistance with staying on track and not missing items. A total of 939 students (99.78%) completed the pretest. A total of 870 students (92.45%) completed the posttest. A total of 847 fully consented students (90.01%) completed both the pretest and the posttest.

Teachers presenting the written curriculum material were asked to complete a fidelity checklist to ensure that all lessons and activities were completed by all classes (or account for those that were not completed in the analysis). Of the 39 teachers that taught the written curriculum, 31 (79.5%) returned the fidelity checklist. In all cases, the teachers reported having completed every lesson and activity. Teachers implementing the CD-ROMs were asked to complete a brief assessment survey of their satisfaction with and usability of the interactive programs. Of the 35 asked to complete the CD-ROM survey, 23 (65.7%) returned it completed.

Outcome Measures

Two primary outcome measures were analyzed: sun safety knowledge and sun protection behavior.

Evaluation Methods

Data were initially examined by summary measures and graphically to identify any potential outliers. Analyses on demographic information were also conducted to check for proper randomization. Two primary outcome measures were analyzed – sun safety knowledge and sun protection behavior. To account for the randomization scheme of grade nested within school, outcome measures were analyzed using PROC MIXED in SAS with a repeated statement specifying the unit of analysis to be grade within school and the covariance structure to be compound symmetric. Alpha criterion level for all tests was set at $p<.05$, two-tailed. Potential covariates were identified and correlations with other covariates and with the two primary outcome variables were calculated. Covariates were then analyzed univariately with both primary outcome measures. Those covariates that were determined to be significantly associated with the outcome measure at an alpha level of 0.05 univariately were used to determine a multivariate model for each primary outcome. The final multivariate model was determined using a backward elimination model building procedure. Secondary analyses were done to

determine the relationship between CD ROM usage and changes in sun safety knowledge and sun protection behavior.

Research Results

The SDHW CD-ROM programs improved the performance of a written curriculum delivered by the classroom teacher excerpted from the longer SDHW elementary school sun safety curriculum in terms of teaching children sun safety-related information. This combined instructional program was superior to either the CD-ROM program or written curriculum alone. However, the CD-ROM program did not perform better than the written curriculum when either was provided separately.

When examined on its own, greater use of the CD-ROM produced corresponding increases in knowledge. However, this use had to occur in the completion of more modules or activities (i.e., exposure to more content) rather than merely spending a longer time on the program. Time spent with the program may be indicative of learning abilities (i.e., slower learners or less competent students might take more time to complete each module) as well as exposure to program content.

Exposure to the CD-ROM program alone or in conjunction with the written curriculum also produced reports of greater sun protection by younger students. In all cases, these improvements were greatest in the group receiving both the CD-ROM program and written curriculum, but even the CD-ROM program produced gains in sun protection that appeared to exceed that obtained from the written curriculum alone. Younger children may be more motivated to alter their behavior by the multimedia program because they are less adept at language and can learn and be influenced by audiovisual and graphic cues. They also may find the multimedia presentation more stimulating and engaging than a presentation delivered by the teacher. Older students may develop linguistic and learning skills that permit teacher presentations to be effective.

Teachers were asked to complete a satisfaction survey at the end of the implementation period. Twenty-three teachers (37%) returned completed surveys. Teachers were very satisfied with the CD-ROM programs, especially the graphic art and animation, sound effects and music. Of the educational modules, teachers liked the clothing module best, followed by the sunscreen module and the shade module. With regard to the tailoring, K-1 teachers were most satisfied (4.8 overall). For reporting purposes, the scales have been reversed in the tables when necessary (from the items on the survey) to reflect the higher score of 5 as the most favorable response in all cases. Teachers were asked to report on their perceptions of how easy it was for their students to use the various parts of the CD-ROM programs. Most activities and module were fairly easy or challenging for students to use. It is positive that no activities were perceived as too easy or too hard to use. As expected, the higher the grade level of the CD-ROM program, the harder the program was perceived to be overall, though the ratings were fairly easy for all grade levels. Teacher usability and plans for future use were assessed with several questions. Overall, teachers believed that sun safety is an important topic to teacher in school. They reported that the CD-ROM programs were very age-appropriate. They did not believe that the programs were too long. They did not believe that the programs were too easy for students, especially at grade 4-5. Overall, teachers reported that they would be likely to use the CD-ROM again and that they would recommend it to other teachers or their school district for wider use.

At posttest, students were asked questions about their satisfaction with the CD-ROM program they interacted with at school. The children who played the SDHW computer game (in either the CD-ROM only or CD-ROM and written curriculum conditions) evaluated it very favorably. Nearly all students

liked the program and their sun-safe pal, felt the game was fun and easy to play, and would like to play the game again. Most also felt that the game provided sun safety messages written for them. The only unfavorable evaluation was that the majority of students felt the game was kind of or very slow. Age affected these evaluations. Children in grades 4 and 5 rated the personal nature of the messages lower than children in kindergarten and grade 1. Younger children in grades K-1 felt the game was easier to play than children in grades 2-3 and grades 4-5.

Overall, the students generally liked the classroom sun safety lessons delivered by teachers in the written curriculum only and CD-ROM and written curriculum conditions. In any grade, less than 20% of students responded that they did not like the lessons at all or that they were not at all fun. However, children in grades 4 and 5 provided less favorable evaluations than children in kindergarten and grade 1 and in grades 2 and 3. Children in grades 4 and 5 may be more critical of all types of instructional formats.

An Instructor's Guide was developed for each of the three CD-ROM programs. The manual was designed as a booklet that fit in the CD-ROM's cover. Each manual contains information about the importance of sun safety, the value of using tailored messages in the CD-ROM, a description about each learning module which includes learning objectives, a description of each CD-ROM's resources (the dictionary and encyclopedias), an explanation for common icons used throughout each CD-ROM, system requirements for each CD-ROM, troubleshooting tips, and information about how to contact Klein Buendel for technical support. Each manual used numerous screen captures from their respective CD-ROMs and short, concise informational paragraphs to describe important aspects of the CD-ROMs. The goal of the instructor's guide was to provide teachers with everything they might need to effectively and easily implement the CD-ROMs in their classrooms.

Barriers & Solutions

During the course of this project, four challenges presented themselves and required resolution:

The Helper Agent: During beta testing it was determined that young users were confused by a complex helper agent A very small percentage of users ever clicked on the helper. The dictionary and encyclopedia features were valuable and worth including but the access was simplified allow students access to the "help" features between modules. Investigators and staff felt it was also important to keep the repeat instructions feature also, so a question mark was included on appropriate pages for users to click on to hear instructions again. This mechanism was easily accessed by users in the school-based intervention and functioned extremely well.

Class Recruitment: The study design called for 72 classes from 12 schools. While 12 schools were recruited, they only yielded 67 classes. One of the schools had no Kindergarten or first grade classes but two third grade classes and one fifth grade class (their only one) were eager to participate. In two of the schools, teachers from some of the grades could not be persuaded to participate. To compensate somewhat, we were able to recruit two Kindergarten classes from two other participating schools. The school sample was now 71. When one school dropped out of the study for technology reasons, seven additional classes were lost resulting in the final sample size of 63 classes. The school dropped out of the study after pretesting and too late to recruit a replacement school. The project biostatistician reviewed the effect of a smaller number of classes and determined that there was still sufficient power to proceed with 63 classes.

Spanish Language Needs: Parent consent forms, student assent forms, pretests and posttests were originally created in English only. Due to the large number of Spanish-speaking students and parents in several of the participating schools, teachers requested Spanish language versions of these items to foster communication and approval of parents and increase comprehension and participation of students. To overcome this communication barrier, these items were translated into Spanish by a professional translator. Spanish parent consent forms were distributed as necessary by teacher. Also, student assent, pretests and posttests were presented orally in Spanish by study interviewers in the classrooms as needed. Other than in rare cases, Spanish language assenting, pretesting and posttesting were most often conducted with Kindergarteners and first graders in same groups.

Parent Consent Return Rate: Initially, the return rate for parent consent forms was lagging at 49%. To increase the return rate two incentive programs were developed, one for teachers and another for students, which resolved the problem and quickly raised the parent consent form return rate to 81%.

Product(s) Developed from This Research

Sunny Days, Healthy Ways Grades K-1 CD-ROM
Sunny Days, Healthy Ways Grades 2-3 CD-ROM
Sunny Days, Healthy Ways Grades 4-5 CD-ROM

Three developmentally successive CD-ROMs (for Grades K-1, 2-3, and 4-5) with 30 to 60 minutes of tailoring activities, interactive movies, and skill-building games addressing risk for sunburn/skin cancer, shade, peak sun hours, cover-up clothing, and sunscreen are included in this product. Each CD-ROM includes a Teacher's Manual. CD-ROMs may be used alone or in conjunction with the Sunny Days, Healthy Ways written lesson plans for Grades K-5.